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DEVELOPING ELECTRIC SERVICE FOR THE FARM

As Exemplified by the Organizations and
Methods of Alabama Power Company

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Serial Report of the RURAL ELECTRIC SERVICE COMMITTEE

1928-1929

July, 1929

NATIONAL ELECTRIC LIGHT ASSOCIATION

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RURAL ELECTRIC SERVICE COMMITTEE—1928-1929

SCOPE: To make a study of the problems connected with rural electric service, to collect accurate information on the cost of this service to the utility; to determine the value of this service to the rural customers; to analyze the various rules, methods of financing and forms of rural rates now being used; to assist in the development of farm equipment suitable for electric drive; to assist in determining the proper standards of rural line construction and to assist the Committee on the Relation of Electricity to Agriculture in carrying on this work; to assist in the development of rural service departments in public utility organizations; to assist in the building of electric power load on the farm.

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Rural Electric Service in Alabama

By THOMAS W. MARTIN, *President*
Alabama Power Company

ALABAMA POWER COMPANY, within the past few years, has invested more than \$2,000,000.00 to enable it to furnish rural electric energy and is now serving more than 6000 Alabama farmers. This statement is made with considerable pride for back of it are plans, purposes and efforts that have been an integral part of the Company's life and growth.

Our trade slogan—"Serving Farm, Factory and Fireside"—puts the farm in a leading place in the Company's ideal of service. In working to this ideal, the necessities of sound financing and healthy growth, governing our Company as they do all successful utilities, required that the service be first extended to cities and thickly populated industrial centers. As these objectives were attained, it was possible to widen the circle and reach farther and farther into the rural sections. This was most opportune for farm life needed a revivifying touch if a balanced ratio between agricultural and industrial pursuits, urban and rural life, was to be maintained.

Electrified farm operation was the contribution the Company began to make and is making towards the relief of this situation. A happy and prosperous, contented and progressive farm home radiates a beneficent and inspiring influence that is reflected in the life of the entire State as well as in the local community. Abundant electric energy at reasonable rates, by removing household drudgery, making profits possible and by affording leisure for the enjoyment of the cultural agencies it brings, gives the farmer the opportunity to have such a home.

The use of household appliances on the 256 lines now in operation is quite general. The application of electric power in farm operations is constantly increasing in scope, as evidenced by the installations being made.

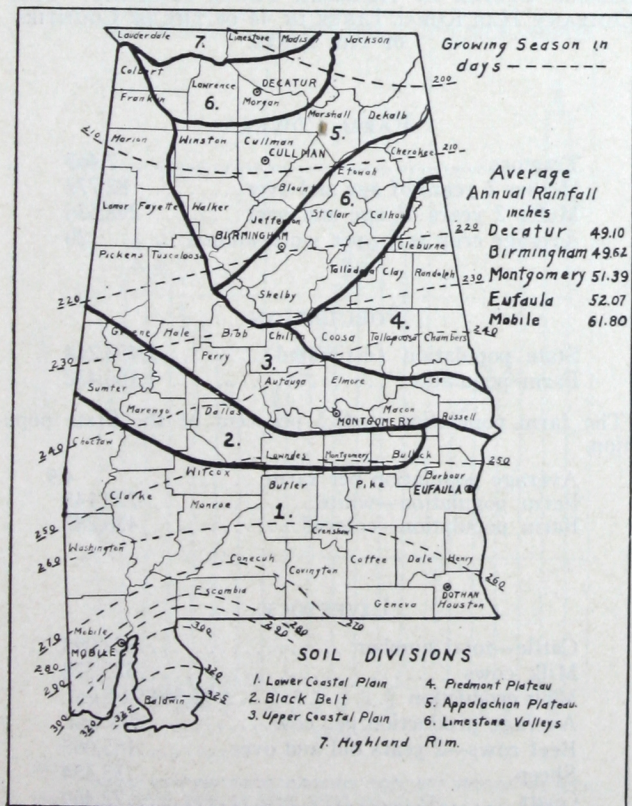
While our rural power revenue is not as yet making a satisfactory return on the investment, we are quite hopeful that the business will be built up to self-sustaining proportions within a reasonable time. Viewing this work from both the economic and social standpoint, we feel fully justified in continuing it as an integral part of our program of service, confident that it is contributing to the prosperity of Alabama.

AS EXEMPLIFIED BY THE ORGANIZATION AND METHODS OF ALABAMA POWER
COMPANY

This is the second of the series. It portrays in detail the rural electric service department of the Alabama Power Company, Birmingham, Ala.; how it was organized; how it fits in with the rest of the organization, how it operates, and the results achieved. In the near future similar reports regarding rural electric service departments in other companies will be issued.

THE AGRICULTURE OF ALABAMA

The Farm Bureau is, through its cooperative marketing and purchasing associations, rendering agriculture a great aid, not only in the handling of products, but also in establishing the cooperative idea among farmers.



Publication No. 289-65, Serial Report.

Industries of the State have become more familiar with the agricultural problems and are cooperating with the farmers very effectively, especially in the distribution of agricultural products for local consumption.

These activities, together with the increased industrialization of the State, are creating a trend toward improved farming methods and a more prosperous agriculture.

Statistical Picture of Alabama Agriculture

Based Largely on Data Collected by U. S. Bureau of Census—1925

Land area of State.....	32,818,560 acres
Land area in farms.....	16,739,139 acres
Per cent of land area in farms.....	51.0

CLASSIFICATION OF FARM LAND

	Acres	Per Cent of Farm Land
Crop land	7,691,713	45.9
Pasture land	3,544,351	21.2
Woodland—not pasture.....	3,855,958	23.1
All other land in farms.....	1,647,114	9.8

FARMS BY SIZE

	Farms by Size	Per cent of Total
Under 3 acres.....	102	0.04
3 to 9 acres.....	9,807	4.10
10 to 19 acres.....	26,262	11.05
20 to 49 acres.....	104,030	43.75
50 to 99 acres.....	53,667	22.60
100 to 174 acres.....	27,885	11.76
175 to 259 acres.....	8,255	3.50
260 to 499 acres.....	5,356	2.25
500 to 999 acres.....	1,616	0.68
1000 to 4999 acres.....	632	0.26
5000 acres and over.....	19	0.01

Total farms in State.....	237,631
Average size farm.....	70.4 acres

FARMERS—COLOR AND TENURE

		Per cent of Total
White farm operators.....	152,310	64.2
Colored farm operators.....	85,321	35.8
Farm owners—white.....	78,614	33.1
Farm owners—colored.....	14,782	6.2
Tenants—white	73,696	31.0
Tenants—colored	70,539	29.7

Percentage of farm owners, 39.3.

FARM VALUES

Land	\$308,663,620
Buildings	106,195,027
Implements and machinery.....	23,850,657
Livestock	62,031,018
All farm property.....	500,740,322
Average value per farm.....	2,107
Average value per acre.....	30

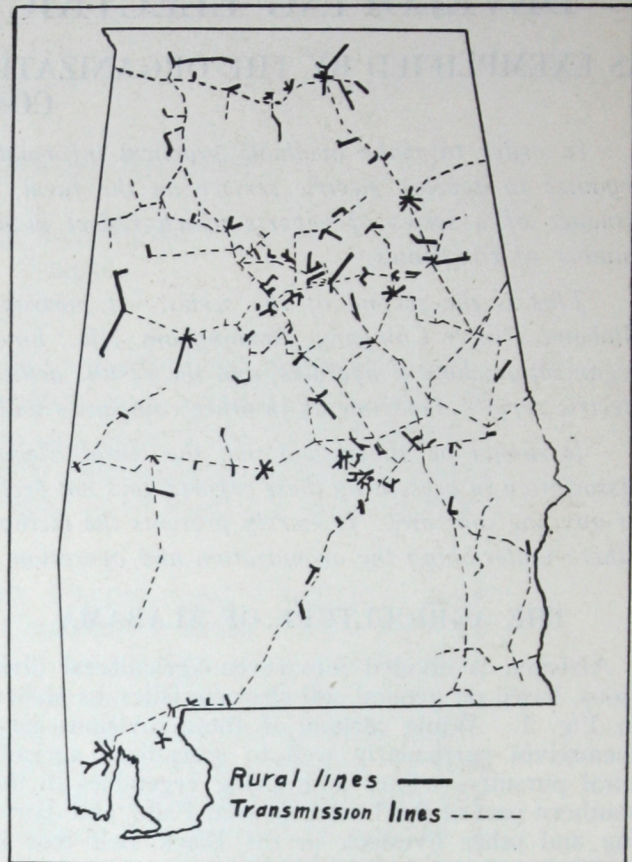


FIG. 2—DISTRIBUTION OF RURAL LINES AND THE TRANSMISSION SYSTEM OF ALABAMA POWER COMPANY. THE COMPANY HAS RURAL LINES IN 44 OF THE 67 COUNTIES OF THE STATE.

FARM POWER

Tractors	2,465
Horses 2 years of age and over.....	82,778
Mules 2 years of age and over.....	298,636
Average crop acres per work animal...	20

POPULATION

State population (estimated).....	2,453,214
Farm population	1,166,432

The farm population is 47.5 per cent of the State population.

Average population per farm.....	4.9
Farm population—white.....	730,145
Farm population—colored.....	436,287

LIVESTOCK

Cattle—total number	822,093
Milk cows	325,578
Milk production	95,364,944 gal.
Average production per cow.....	293 gal.
Beef cows—2 years old and over.....	165,065
Sheep	55,554
Goats	72,469
Swine	826,833
Chickens	6,284,460
Egg production	19,466,770 doz.
Chickens raised	9,527,321

CROPS

	Acres	Average Yield per Acre
Corn	2,788,733	12.0 bushels
Wheat	6,070	10.0 bushels
Oats	84,853	15.0 bushels
Sorghum	23,867	....
Peanuts	253,827	19.5 bushels
Velvet beans.....	310,872	....
Navy beans.....	2,109	....
Hay	508,949	.73 tons
Cotton	2,948,072	.333 bales
Sugar cane and sorghum for syrup	35,020	....
Potatoes, white.....	16,695	98.0 bushels
Sweet potatoes and yams.....	48,443	77.0 bushels
Strawberries	3,125	....
Watermelons	20,608	....
Vegetables	8,198	....

Trees

Apple trees of bearing age...	798,070	12.50 bush. per tree
Apple trees not of bearing age.	426,342	
Peach trees.....	1,849,990	
Orange trees—bearing age....	262,689	
Orange trees—not bearing age.	359,126	
Pecan trees—bearing age.....	303,399	
Pecan trees—not bearing age.	406,271	
Other fruit trees.....	317,034	

Vines

Grape vines.....	239,221
Value of all farm crops, \$181,026,321.	

COMMUNITY ENTERPRISES

Gins	1,525
Creameries and cheese plants.....	76
Canneries (1927).....	18

STATE HIGHWAYS

The state highway system, which is under the supervision of the State Highway Department, comprises approximately 5600 miles of road. This is less than 10 per cent of the total road mileage of the State, and is classified as follows:

	Miles of Road
Paved	700
Gravel	1,705
Sand-clay	844
Improved dirt.....	768
Unimproved dirt	1,576

RURAL ELECTRIC DEVELOPMENT IN ALABAMA

The rural electric development by Alabama Power Company includes the expansion of electric service outside the corporate limits of towns and cities, serving less than twenty customers per mile of distribution line, and does not refer to purely farm service. On Jan. 1, 1929, the company was serving 5511 rural customers from 836.5 miles of lines, an average density of 6.8 customers per mile

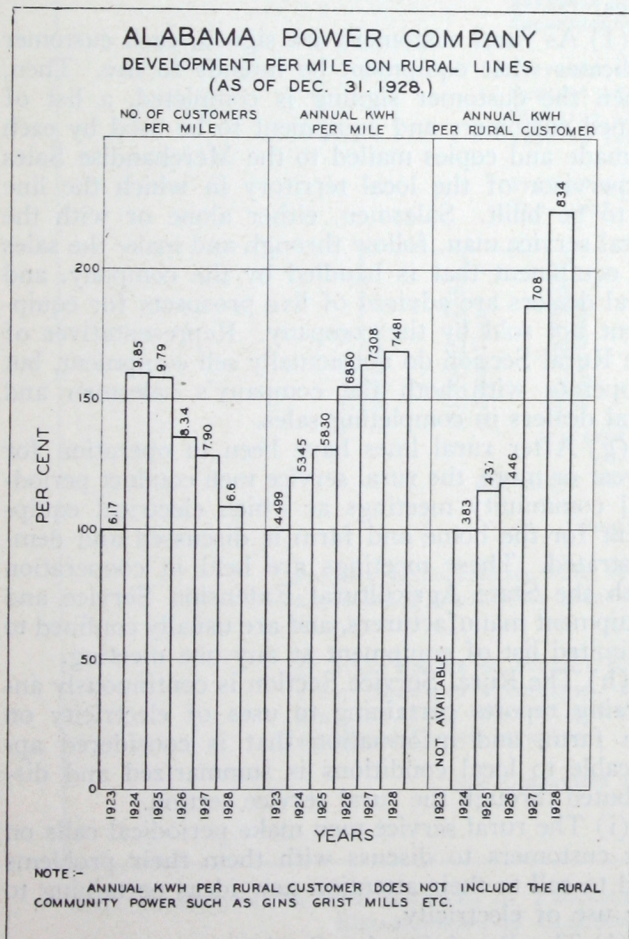


FIG. 3—DEVELOPMENT PER MILE ON RURAL LINES—ALABAMA POWER COMPANY.

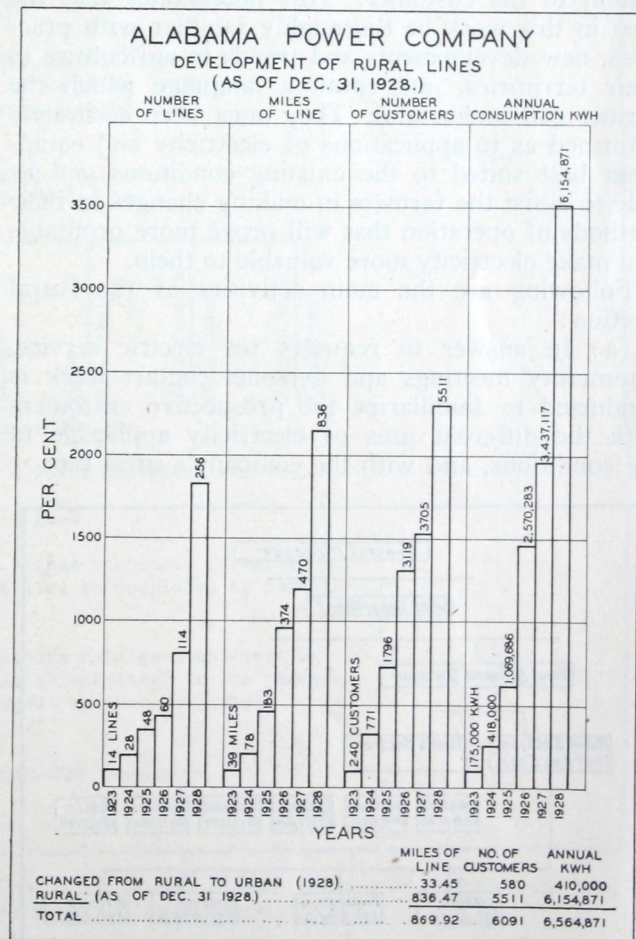


FIG. 4—DEVELOPMENT OF RURAL LINES—ALABAMA POWER COMPANY.

FIG. 7—THE COMPANY USES NEWSPAPER ADVERTISING TO ACQUAINT FARMERS WITH THE POSSIBILITIES OF ELECTRICITY IN AGRICULTURE, AND ALSO TO EMPHASIZE THAT INDUSTRIAL DEVELOPMENT IN THE STATE CREATES ADDITIONAL MARKETS FOR AGRICULTURAL PRODUCTS.

SERVICE CLASSIFICATION "E"

RURAL ELECTRIC SERVICE

110-220 VOLTS

AVAILABILITY

Available to any Consumer served from a rural distribution line of the Company for electric lighting, cooking, heating, refrigeration or farm power service, or any combination of these, where the total consumption can be measured by one meter.

RATE

5½ cents per KWH for the first 50 KWH consumed per month; plus
3½ cents per KWH for the next 950 KWH consumed per month; plus
2½ cents per KWH for all over 1,000 KWH consumed per month.

DISCOUNT

The current monthly bill is subject to a discount of ½ cent per KWH of energy consumed, provided the amount is paid in full at the office of the Company within ten days from date of bill.

RURAL LINE CHARGE

In addition to the rate for electric energy actually consumed each Consumer receiving service from a rural line shall pay monthly a Rural Line Charge based upon the number of Consumers per mile and the individual capacity contracted for, as follows:

Monthly Rural Line Charge:	Consumers per Mile			
	Over 15 Group "A"	Over 10 & not more than 15 Group "B"	Over 5 & not more than 10 Group "C"	5 or less Group "D"
For the 1st KW of contracted capacity or fraction thereof....	\$1.75	\$2.25	\$3.00	\$4.00
For each additional KW of contracted capacity	1.50	1.50	1.50	1.50

DETERMINATION OF CONSUMERS PER MILE & CONSUMERS' CONTRACTED CAPACITY

The Consumers per Mile shall be the total number of consumers served from the rural line, not including those in urban centers served from such line, divided by the total mileage of distribution pole line serving such Consumers, exclusive of service lines.

The Contracted Capacity of each Consumer shall be the sum total of his load requirements determined as hereinafter set out but not less than an amount sufficient to bring the total contracted capacity of all Consumers served by a rural line under this Classification to a minimum of 10 KW per mile of rural line. When urban or industrial load is served from a rural line the Company will credit the rural line with such

(Continued)

Effective for service rendered from rural lines authorized and constructed subsequent to July 1, 1927; for service rendered to any rural consumer requesting this classification on existing experimental rural lines; and for all rural service after June 30, 1930.

FIG. 8—SERVICE CLASSIFICATION "E," RURAL ELECTRIC SERVICE—PAGE 1, ALABAMA POWER COMPANY.

SERVICE CLASSIFICATION "E"

RURAL ELECTRIC SERVICE

110-220 VOLTS

(Continued)

business and will modify the minimum rural requirements according to Rule 9 under Special Rules Governing the Application of Service Classification "E".

Lighting Load:

Ordinary farm and household lighting load (including lamp socket appliances not permanently connected) will not be counted in determining contracted capacity, except where no other load is connected and in such case of lighting load only the contracted capacity shall not be less than 1 KW.

Motor Load:

a. GENERAL POWER—

The kilowatts of motor load other than seasonal power shall be as follows:
70% of the horsepower rating of the largest capacity motor; plus
50% of the horsepower rating of all other motors.

b. SEASONAL POWER—

The largest capacity motor used exclusively for farm power service, if of 10 horsepower rating or over, shall be considered a seasonal load and the kilowatts of motor load shall be taken as 25 per cent of its horsepower rating, provided the transformer capacity required for its operation is furnished by the Consumer.

Range Load:

25% of the connected domestic range load, but not less than 2 kilowatts.

Heating and All Other Load:

100% of the Manufacturer's rating of such equipment, or by test.

Where double throw switches are used, the maximum sum total of the Consumer's loads, as determined above, which can be operated at one time, will determine the contracted capacity.

OPTIONAL DEPOSIT IN LIEU OF RURAL LINE CHARGE

Any Consumer receiving service from a rural line may, at his option and in lieu of the monthly Rural Line Charge, deposit with the Company an amount equal to \$150 for each \$1 of monthly Rural Line Charge as determined above. Such deposit will be returned to the Consumer in full without interest at the time of the termination of his contract and in no instance less than one year from the beginning of service.

(Continued)

Effective for service rendered from rural lines authorized and constructed subsequent to July 1, 1927; for service rendered to any rural consumer requesting this classification on existing experimental rural lines; and for all rural service after June 30, 1930.

SERVICE CLASSIFICATION "E"
RURAL ELECTRIC SERVICE
110-220 VOLTS
(Continued)

SPECIAL RULES GOVERNING THE APPLICATION OF SERVICE
CLASSIFICATION "E"

1. A Rural Line is defined to be:
 - A. Any electrical distribution line of 11,000 volts or less, not within the corporate limits of a municipality, which serves less than twenty Consumers per mile of pole line, and/or
 - B. Any electrical distribution line of 11,000 volts or less, within the corporate limits of a municipality, which serves less than twenty Consumers per mile of pole line, upon approval of the Alabama Public Service Commission.
2. Each rural line as originally constructed shall be considered a unit in applying the rural line charge, unless there is such a wide difference in Consumer-density between sections or branches of such line as to constitute marked discrimination against the higher density group, and in this event such sections or branches may be considered separate rural lines.
3. New Consumers added to a rural line will be served under the same rural line charge as existing Consumers on such line, unless such addition constitutes an extension which would reduce the average number of Consumers per mile of line, in which event the extension shall be considered a new rural line.
4. Any section of a rural line immediately adjacent to the source of supply of such line reaching a density of 20 Consumers per mile shall become an urban line and service shall be rendered to such section at such urban rates as may be applicable, provided the remainder of such rural line can be served without increase in rural line charge to the Consumers served therefrom.
5. The Rural Line Charge or equivalent optional Rural Line Deposit of each Consumer shall be subject to adjustment on January 1st of each year.
6. The Company will furnish and install, free of expense to the Consumer, service wires from its pole line to the first approved point of permanent support, or to the first pole of service on Consumer's premises. Special service lines required to be constructed on private property shall be constructed by the Company at cost and will be subject to a special agreement between the Company and the Consumer, or Consumers, to be served.
7. Where three phase service is available for farm power service, such service at the option of the Consumer may be established for motor loads of 5 h. p. and over and billed as to a separate Consumer under this rate.
8. Any industrial Consumer served from a rural line shall be billed at the rate on file with the Public Service Commission applicable to such service.
9. The credit to a rural line for urban or industrial business shall be figured as follows:

(Continued)

Effective for service rendered from rural lines authorized and constructed subsequent to July 1, 1927; for service rendered to any rural consumer requesting this classification on existing experimental rural lines; and for all rural service after June 30, 1930.

FIG. 10—SERVICE CLASSIFICATION "E," RURAL ELECTRIC SERVICE PAGE 3, ALABAMA POWER COMPANY.

SERVICE CLASSIFICATION "E"

RURAL ELECTRIC SERVICE

110-220 VOLTS

(Continued)

- a. *Equivalent Rural Consumers:* To be found by taking four times the estimated first year's revenue to be received from the urban or industrial load less the initial cost to connect such additional load and dividing the remainder by 200.
- b. *Contracted Capacity:* Each equivalent Rural Consumer as determined above shall be considered as having one (1) kilowatt of contracted capacity.

NOTE: Rule 9 is based on the Company being willing to spend four times the initial annual revenue to obtain urban or industrial business served from a rural line and upon an average revenue per rural Consumer of \$50.00 per year. Reduced to a formula Rule 9-a becomes:

Equivalent Rural Consumers equals

$$\frac{\text{Estimated First Year's Revenue}}{\$50} \text{ less } \frac{\text{Estimated Initial Cost to Connect}}{4 \text{ times } \$50}, \text{ or}$$

$$\frac{(4 \text{ times Estimated First Year's Revenue})}{200} \text{ minus } (\text{Initial Cost to Connect}).$$

MINIMUM

In consideration of the readiness of the Company to furnish such service, a monthly minimum charge equal to the Rural Line Charge will be made.

TERM OF CONTRACT

Service under this Classification shall be for a period of not less than:

- (1) Five years on rural lines having an average of not over five (5) Consumers per mile of line,
- (2) Three years on rural lines having an average of not less than five (5) and not over ten (10) Consumers per mile of line,
- (3) One year on rural lines having an average of more than ten (10) Consumers per mile of line,

and thereafter from year to year, unless terminated by thirty (30) days written notice.

Service under this Classification is subject to Rules and Regulations approved or prescribed by the Alabama Public Service Commission.

Effective for service rendered from rural lines authorized and constructed subsequent to July 1, 1927; for service rendered to any rural consumer requesting this classification on existing experimental rural lines; and for all rural service after June 30, 1930.

FIG. 11—SERVICE CLASSIFICATION "E," RURAL ELECTRIC SERVICE—PAGE 4, ALABAMA POWER COMPANY.

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CUSTOMER DEPOSIT CARD

(To be returned to applicant upon receipt of deposit)

Alabama Power Company,
Birmingham, Alabama.

Gentlemen:

I have today made written application to you for electric service at my residence at _____, Alabama, on your Form 1173 Service Classification _____. I understand that your rules and regulations require the deposit of \$_____ to insure prompt payment of bills for such service. I beg to advise that I will make such deposit on demand after construction work has begun on the distribution system in _____ and before the service is connected to my premises.

Yours very truly,

FIG. 13—CUSTOMER DEPOSIT CARD, ALABAMA POWER COMPANY.

manufacturers in the development of equipment needed for local conditions.

(k) When a farmer requests information for special installations, the Rural Service Section furnishes all available information and refers the prospect to such manufacturing companies that have shown ability and willingness to insure proper installations.

(l) Through the Manager of the Rural and Towns Division, the Engineering and Operating Departments are informed as to the nature of rural load affecting the construction and operation of rural lines. A consistent effort is made to prevent the lagging of rural line construction too far behind the signing of customers.

(m) In cooperation with the company's Publicity Department, the Rural Service Section prepared a thirty-two page booklet entitled "Electricity Serves the Farm." Ten thousand copies of this booklet were published and distributed, mainly to farmers of the State.

(n) The Rural Service Section cooperates with the Publicity Department in the preparation of advertising and news items for newspapers and magazines. The company's slogan is "Serving Farm, Factory and Fireside."

(o) Copies of "Electricity on the Farm" are distributed regularly to a selected list of 300 farm customers.

(p) The Rural Service Section cooperates with other agricultural agencies of the State in problems pertaining to the use of electricity in agriculture. An annual report of the Progress of Rural Electrifica-

tion is made to the Director of Agricultural Extension Service. Information as to the development of rural electric service is furnished the Agricultural Editor of the Extension Service.

(q) Close cooperation is maintained with the National Committee on the Relation of Electricity to Agriculture and the Rural Electric Service Committee of the National Electric Light Association, in the effort to make available more general and specific information as to rural electrification.

(r) The Rural Service Section keeps records of individual customers, rural lines and different equipment, necessary to keep an accurate check of the development's progress. A monthly report is made to the management, including the number of customers, number of lines and miles of lines added during the month, the total on the first of each month, the projects authorized and under construction and those under consideration.

A detailed annual report is made to the management, including customers, miles of lines and annual kilowatt-hour sales, with the progress made during the year in the different parts of the activity, as load building and increased energy consumption per rural customer, and per mile of rural line.

Selling Equipment to Rural Customers

Equipment handled by the company is sold to rural customers by representatives of the Merchandise Division. In case a rural customer desires equipment not sold by the company, arrangements are made to have his needs taken care of either by a local dealer or by the manufacturing company.

The company handles the usual line of electrical equipment, including ranges, water heaters, household refrigerators, washing machines and small appliances for the home. In addition, the company sells a line of water pumps especially for small town and rural customers.

Other equipment demanded by farmers, including dairy refrigerators, feed grinders, overhead irrigation systems, milking machines, incubators, brooders and motors, is sold by local dealers or factory representatives. The general sales plan is through the "live prospect" approach. These prospects are turned in by the rural service men. Prospects are found by the rural service men at the time of signing customers, or by the customers writing to the Rural Service Section for information pertaining to the use of some piece of equipment.

For equipment sold by the company the same term payments are offered to rural customers as to other classes of customers. These terms vary with different pieces of equipment.

The most important items sold to rural customers from a satisfactory load building standpoint are ranges, dairy refrigerators, household refrigerators and water systems. It is probable that farm refrigeration in its different ramifications will become the base load for rural electrification in this State. Sales efforts are turning in this direction.

Meter Reading and Billing Rural Customers

Meter reading and billing rural customers is handled just as the other classes of customers served by the company. Meters are read each month by the regular meter readers, and bills are rendered monthly by the Accounting Department.

Developing Appreciation of Rural Electric Service

Within the Company

Realizing that the success of rural electric development is dependent upon making it a part of the company's general program, rather than purely the activity of a separate division, those directly connected with this work have continuously attempted to sell the other departments of the company as to the progress and results obtained. This effort is through direct contact with employees of the different departments and through the preparation of monthly and annual progress reports. However, with the method of procedure followed by this company practically every department has an active part in the development just as with other classes of service. The surveys for new proposed lines are made by the Towns Division, the engineering is handled by the Engineering Department, the lines are built by the construction company, household equipment is sold to rural customers by the Merchandise Division, the lines are operated and service maintained by the Operating and Service Departments, and the rural customer billing and collecting is taken care of by the Accounting Department. Therefore, each department is somewhat familiar with the progress of the development.

Among Rural People

Interest in rural electric service was created in Alabama through exhibits at state and county fairs for two seasons, illustrating some of the uses and advantages of electricity, and through the progress of the experimental work conducted by the company and the Agricultural Experiment Station for a period of three years. This interest in and the appreciation of the value of electric service is maintained and developed among rural customers through education work conducted through direct contact with proposed and existing customers, and through cooperation with other agricultural agencies of the State. For example: In 1927 the company, in cooperation with the Dairy Department of the Agricultural Extension Service and the International Harvester Company, held a series of meetings throughout the State at which dairy equipment was discussed and demonstrated. In 1928 a series of meetings were held throughout the State in cooperation with the Home Demonstration Agents, and the Edison Electric Appliance Co. At these meetings the uses of electrical household appliances for the farm home were discussed and demonstrated. The agricultural engineers of the company devote the major part of their time in an effort to educate proposed and existing rural customers as to profitable applications of electricity. In 1928, as a part of its load-building program, the company published a farm booklet, discussing and illustrating some of the uses of electricity on Alabama farms. These booklets have been distributed among the existing and proposed rural customers.

Results and Effects

Number of rural lines Jan. 1, 1924.....	14
Number of rural lines Jan. 1, 1929.....	256
Miles of rural lines, Jan. 1, 1924.....	39
Miles of rural lines, Jan. 1, 1929.....	836.5
Number of rural customers Jan. 1, 1924.....	240
Number of rural customers Jan. 1, 1929.....	5,511

ANNUAL KW-HR. CONSUMPTION PER RURAL CUSTOMER

Lines Built	Dec. 31, 1927	Dec. 31, 1928
1928 .....	...	670
1927 .....	...	728
1926	445	512
1925	629	671
1924 (or earlier).....	900	1260
Total.....	708	834

The 256 lines are not only serving the present rural customers, but are also sources of electric service for additional extensions in the future development.

The company has an organization for conducting rural electric service work, actively engaged in an effort to build additional rural lines and to increase the load on existing rural lines.

The company had designed a rate for rural electric service, which has established rural electrification as a definite part of the company's development on a business basis.

The farmer's interest in the uses of electric service has been created and developed very rapidly.

The farmers of the State understand that the power company is perfectly willing and anxious to

attempt in every way economically possible to extend service to them. They also appreciate the fact that if rural electric service is to be successful it must be satisfactory to the customers and the company.

The company realizes that it is possible to develop a satisfactory rural load.

The average energy consumption by rural customers has increased from 383 kw-hr. in 1924 to 834 kw-hr. in 1928.

Rural electric service is:

1. Resulting in more comfortable and attractive living conditions on the farm.
2. Creating new interest in farming as a life occupation.
3. Reducing farm operating costs and making practical a better balanced farming program.
4. Making available a source of convenient power for the operation of rural community enterprises.
5. Establishing a better mutual understanding between the farmers and the company.

RURAL LINES AND SYSTEMS

I. Types of Systems

- (a) 2300 and 4000-volt systems.
- (b) 6900-volt systems.
- (c) 11,500-volt systems.

The 2300 and 4000-volt systems are merely short extensions of existing urban distribution systems which are extended into rural territory. The 6900-volt, 3 ϕ lines were first constructed when it developed that the 2300 and 4000-volt lines did not have capacity to supply the loads as found in the rural territory in Alabama. The majority of these lines have been reconnected as four-wire systems for 11,000-volt operation. Practically all of the rural lines now being constructed by the company are 11,000-volt systems.

These lines are supplied either from step-up banks located at the end of an urban feeder or from separate rural distribution substations. These are usually 44,000 to 6900-volt Y substations, equipped with automatic reclosing circuit breaker and ground relay protection which opens the circuit in case the conductor falls to the ground.

II. Line Construction

Lines are constructed according to the following general specifications:

(a) Right of way:

Lines are constructed along the margin of the public road, permission being obtained from state or county authorities. Tree trimming and anchor rights are obtained from individual property owners.

(b) Poles:

35 ft. 6 in. top creosoted pine.

(c) Cross arms:

Standard N. E. L. A. 6-pin arms with standard braces and hardware.

(d) Conductors:

Conductors are either hard-drawn copper or aluminum cable steel reinforced.

(e) Pins:

Standard wood pins are used on straight line construction. A clamp-on steel pin for small angles and dead end with strain insulators on angles 30 deg. and over.

(f) Insulators:

Insulators are standard 17 kv. porcelain pin type.

NOTE: Even though lines are built to operate at 2300 or 6900 volts, they usually are insulated for 11,000-volt operation, in view of changing over to this voltage as load conditions may require.

(g) Pole Spacing:

Pole spacing is approximately 275 ft. with copper conductors, and 325 to 350 ft. with aluminum. Highway conditions often make it impossible to obtain a 325-ft. span, in which case the company has found it more economical to use copper conductors.

(h) Anchoring:

Angles of 7 deg. and less usually are held by raking the pole without anchoring. Angles of over 7 deg. are supported with one or two patented anchors as required.

Pole setting and wire stringing is done in accordance with the National Electric Safety Code.

III. Secondary Service

Secondary service usually is furnished at 110-220 1 ϕ or 220 3 ϕ . Transformers are standard distribution transformers protected with open type of fuses and standard lightning arresters.

On the majority of systems of the Alabama Power Company it is found economical to string secondary systems and connect several customers from the same transformer bank.

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